

**WHAT IS CLAIMED IS:**

1        1.        A method for managing workload distribution in a multiple processor cluster  
2        system to conserve energy, comprising the steps of:

3                classifying persistent states and connections within said cluster system  
4        according to an activity referencing said persistent states and connections;

5                receiving a request to modify a workload of said cluster system;

6                determining a minimum number of processors in said cluster system for  
7        executing said modified workload while maintaining said persistent states and  
8        connections;

9                determining a workload distribution within said minimum number of  
10       processors that satisfies said modified workload while maintaining said persistent  
11       states and connections; and

12               modifying an operation mode of a selected processor in said processors of said  
13       cluster system to conserve energy while satisfying said modified workload while  
14       maintaining said persistent states and connections.

1        2.        The method of claim 1, further comprising the step of migrating persistent  
2        states and connections within said cluster system to effect said workload distribution.

1        3.        The method of claim 1, wherein said operation mode of said selected  
2        processor is modified by setting said selected processor to an off mode.

1        4.        The method of claim 1, wherein said operation mode of said selected  
2        processor is modified by setting said selected processor to a stand-by mode.

1        5.        The method of claim 1, wherein said operation mode of said selected  
2        processor is modified by setting said selected processor to an active full power mode  
3        from an off or a stand-by mode.

1 6. The method of claim 1, wherein said step of determining said workload  
2 distribution for said minimum number of processors uses a constraint based bin  
3 packing algorithm.

1 7. The method of claim 5, wherein a particular constraint of said bin packing  
2 algorithm comprises minimizing a number of processes and states migrated to effect  
3 said workload distribution.

1 8. A cluster system comprising;  
2 a multiple processor central processing unit (CPU) having circuitry for  
3 classifying persistent states and connections within said cluster system according to  
4 an activity referencing said persistent states and connections, circuitry for receiving a  
5 request to modify a workload of said cluster system, circuitry for determining a  
6 minimum number of processors in said cluster system for executing said modified  
7 workload while maintaining said persistent states and connections, circuitry for  
8 determining a workload distribution within said minimum number of processors that  
9 satisfies said modified workload while maintaining said persistent states and  
10 connections, and circuitry for modifying an operation mode of a selected processor in  
11 said processors of said cluster system to conserve energy while satisfying said  
12 modified workload while maintaining said persistent states and connections;  
13 a random access memory (RAM);  
14 a communications adapter coupled to a communication network; and  
15 a bus system coupling said CPUs to said communications adapter and said  
16 RAM.

1 9. The cluster system of claim 9, further comprising the step of migrating  
2 persistent states and connections within said cluster system to effect said workload  
3 distribution.

1 10. The cluster system of claim 9, wherein said operation mode of said selected  
2 processor is modified by setting said selected processor to an off mode.

1 11. The cluster system of claim 9, wherein said operation mode of said selected  
2 processor is modified by setting said selected processor to a stand-by mode.

1 12. The cluster system of claim 9, wherein said operation mode of said selected  
2 processor is modified by setting said selected processor to an active full power mode  
3 from an off or a stand-by mode.

1 13. The cluster system of claim 9, wherein said step of determining said workload  
2 distribution for said minimum number of processors uses a constraint based bin  
3 packing algorithm.

1 14. The cluster system of claim 13, wherein a particular constraint of said bin  
2 packing algorithm comprises minimizing a number of processes and states migrated  
3 to effect said workload distribution.

1 15. A computer program product for managing workload distribution in a multiple  
2 processor cluster system to conserve energy, said computer program product  
3 embodied in a machine readable medium for energy management in a computer  
4 system having a plurality of computation nodes, including programming for a  
5 processor, said computer program comprising a program of instructions for  
6 performing the program steps of:

7 classifying persistent states and connections within said cluster system  
8 according to an activity referencing said persistent states and connections;

9 receiving a request to modify a workload of said cluster system;

10 determining a minimum number of processors in said cluster system for  
11 executing said modified workload while maintaining said persistent states and  
12 connections;

13 determining a workload distribution within said minimum number of  
14 processors that satisfies said modified workload while maintaining said persistent  
15 states and connections; and

16 modifying an operation mode of a selected processor in said processors of said  
17 cluster system to conserve energy while satisfying said modified workload while  
18 maintaining said persistent states and connections.

1 16. The computer program product of claim 15, further comprising the step of  
2 migrating persistent states and connections within said cluster system to effect said  
3 workload distribution.

1 17. The computer program product of claim 15, wherein said operation mode of  
2 said selected processor is modified by setting said selected processor to an off mode.

1 18. The computer program product of claim 15, wherein said operation mode of  
2 said selected processor is modified by setting said selected processor to a stand-by  
3 mode.

1 19. The computer program product of claim 15, wherein said operation mode of  
2 said selected processor is modified by setting said selected processor to an active full  
3 power mode from an off or a stand-by mode.

1 20. The computer program product of claim 15, wherein said step of determining  
2 said workload distribution for said minimum number of processors uses a constraint  
3 based bin packing algorithm.

1 21. The computer program product of claim 20, wherein a particular constraint of  
2 said bin packing algorithm comprises minimizing a number of processes and states  
3 migrated to effect said workload distribution.